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Soil Conservation

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Against the wooded hill it stands,
Ghosts of a dead home staring through
Its broken lights on wasted lands
Where old-time harvests grew.
—JOHN GREENLEAF WHITTIER

COVER PICTURE.— A multipurpose pond in Tennessee that provides running water and fire protection for the house and barn along with fishing, boating, and swimming facilities for the people.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

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TOM DALE, Editor

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Trout—A Crop of the Land

By Randy Strate

THE idea that fish—and specifically trout—are a product of the land is the guiding principle behind a new kind of watershed improvement program on the White River in west central Michigan. It is expected to result in better fishing, better farming, and a higher standard of living for all folks who live in the 132,000-acre watershed.

The White River originates in the swamps of Norwich township in central Newaygo County. It flows southwestward across the county into Oceana County and continues across Oceana County to White Lake and thence into Lake Michigan.

The Michigan Department of Conservation became interested in the White River project back in 1954. Using $70,000 of fishing license and fishing tackle tax money, the Stream Improvement Section of the department made an inventory of the streams in the White River drainage area.

Armed with aerial photographs and base maps showing lakes, streams, roads, and towns, the Conservation Department crew went to work. They walked and surveyed the entire 131 miles of the White River and its feeder streams or tributaries.

The survey turned up many things that could be hampering the reproduction and development of trout. Stream temperatures in most of the main streams were marginal for the support of trout, which require cool, clear water. Lack of trees for shade was part of the problem. Also, five beaver dams and an artificial lake backed water up into slow-moving pools that warmed up the water.

Spring floods, with their load of silt from the uplands, were filling holes, covering up spawning beds, and lowering the stream's ability to raise food for fish. The lack of escape cover and hiding places, pollution from barnyards, and many other discouraging conditions were noted. Was it any wonder that fishing was poor?

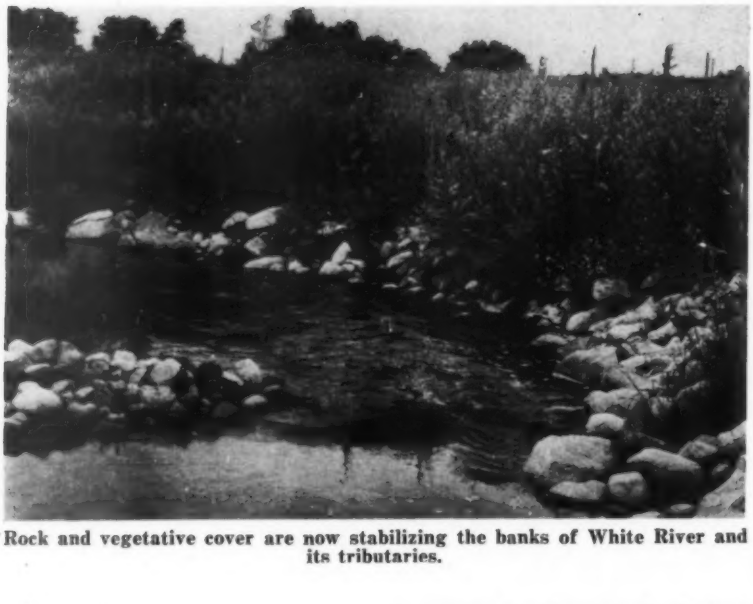
Brook trout once were common in many Michigan streams all the way to the Indiana border. Grayling, one of the scrappiest and best tasting of Michigan fish, were found as far south as the White River. Now, however, the White is considered the southernmost major trout stream in the State and grayling have become extinct.

It didn't take the Conservation Department long to find out that care of the streams and care of the land along the streams were both parts of the same problem. Pastures were being overgrazed on light, erosive soil. Fall plowing and cropping systems short on grasses and legumes were responsible for much of the silt being deposited in the streams. Streambanks were being trampled by livestock. Road ditches were being gullied in some places and filled with silt in others.

Trout probably are one of the best barometers of the kind of land use we have in a watershed. They are directly affected by water temperatures, silt flowing into streams from the uplands, the lack of shade because the timber has been cut, or pollution from a factory dumping commercial waste into the stream. Improper land use probably had been the major factor in causing the brook trout to move farther north and the grayling to become

A severely eroded field, common in the White River watershed.

Note:—The author is work unit conservationist, Soil Conservation Service, Fremont, Michigan.



Rock and vegetative cover are now stabilizing the banks of White River and its tributaries.

only a memory.

Realizing there wasn't much point in placing improvement structures in the streams if silt and warm water were to continue to enter, the investigators decided to consult with local officials of the Soil Conservation Service about these "problems of the land."

With the basic information already gathered, it was easy to swing into action. The Department of Conservation planner and the local SCS man conferred with the soil conservation district officials and other community leaders. A steering committee was formed from several organizations in the watershed and members of this committee carried the ideas and plans back to their respective groups.

Small neighborhood groups of farmers were formed. In meetings held in some of their homes, farmers were told about changes proposed on the land as part of the action program. They were asked to give easements and rights-of-way to permit construction crews to move about unhampered. Extent of the cooperation from landowners can be seen in the fact that only one owner in the entire watershed objected to signing an easement. Promoters of the project hope his objections will be temporary.

Others were enthusiastic, too. Among those putting their shoulders to the wheel were members of the Newaygo Soil Conservation District board, other farmer organizations, sportsmen's clubs, social clubs, U.S. Forest Service, County Road Commission, Chambers of Commerce, and individual landowners.

With the way paved for action, three crews went to work under the guidance of Conservation Department men in the spring of 1955. Control of streambank erosion and stabilization of the stream bottom drew first priority. Banks were graded, sodded or seeded on the face, and protected at the top with rock riprap. Log aprons, jetties, and streambank plantings were begun. Over a mile of rock riprap alone was needed.

Some of the structures used in the streams were single and double wing deflectors, boom covers, pine stump and sodded log covers, abutment dams, and gravel spawning boxes.

To eliminate temperature rises in the streams, beaver dams were removed. The beaver were live-trapped and moved into other

A log deflector, one of the many types of stream control structures now used to improve fish habitat in the White River.

areas where they could use their engineering skills without raising the ire of trout fishermen.

Work began on some 2,000 rods of fence to exclude cattle from overgrazed areas along the streams. Included were the construction of stiles, stream crossings, and gravel ramps to the streams for watering livestock.

At the city of White Cloud, reconstruction of an old dam was undertaken. The revamped structure has an underspill that takes cool water from the bottom of the lake instead of warm water from the surface and puts it into the stream. The cool water helps to hold stream temperature down in the hot days of July and August.

Up on the watershed farmlands, too, work has been progressing. Soil conservationists are busy working with farmers and landowners, planning with them the proper use of their land and furnishing them with the technical know-how to establish good soil conservation practices.

Proper land drainage, contour stripcropping, better crop rotations, improved seeds and seeding methods, trees planted on marginal and submarginal areas, windbreaks and wildlife area improvements are only a few of the effective conservation practices being encouraged. Goals of some practices are large and will take years to complete. In this one watershed, for example, there are 11,000 acres in need of reforestation.

The major part of the work on all 131 miles of streams in the White watershed has now been completed. A total of 149 sections of streambank have been protected; 974 stream habitat structures placed; the five beaver dams removed; an underspill dam constructed and water temperature downstream lowered by 10 degrees;

Contour stripcropping in the White River watershed.

231 rods of woven wire fence constructed to prevent livestock from grazing banks; and 750,000 trees purchased and planted by landowners.

Sponsors of the project realize that a certain amount of maintenance will be necessary, but basic work in and along the streams will stay many years without extra cost.

Harold Goyings, a farmer on the watershed and an ardent trout fisherman, recalls that the crews of the old Civilian Conservation Corps were looking for answers to a dwindling trout population way back in the 1930's. They mapped stream bottoms, put in structures, and collected stream water temperatures.

"We didn't think our luck was too bad in those days," said Harold. "With a little effort and a lot of pleasure, it wasn't difficult to fill your creel. Nowadays it's news when someone catches his limit—and the limit is a lot less than it was 25 years ago."

Goyings thinks he can see results already from the new watershed project. "Fishing has improved in numbers and size in the White. I'm certainly all for this double-barreled approach to soil conservation and stream improvement. I can enjoy better fishing and improve my farming, too."

Tree planting in the White River watershed.

Soil types classified as building sites

Information on the fitness of various soil types in Hartford County for building sites has been published by the Connecticut Experiment Station at Storrs for use of planning officers, builders, and buyers of new houses. All soils found in the county are rated as to fitness for urban development. Of the 68 named soil series, 41 were rated as poor or very poor for urban development.

◆

U.S. Department of Agriculture studies indicate that liming acid soils sometimes improves the efficiency of fertilizer utilization as much as fourfold.

Good Fishing in Sportsman's Lake and Flood Prevention on Tiger Creek

By George Crouse

AN example of the far-reaching benefits that can be realized by cooperative planning to take full advantage of opportunities afforded for watershed protection and multiple use of impoundments under Public Law 566 (the Watershed Protection and Flood Prevention Act) has been presented in Oklahoma with completion of Sportsman's Lake in Seminole County.

The lake, one of 60 detention reservoirs planned to help control floods on Wewoka Creek, was recently opened for public fishing by the State Department of Wildlife Conservation. While there are many larger bodies of water in the Sooner State, none have been built with a greater measure of cooperation on the part of governmental agencies, together with a full measure of encouragement and support from local groups. Few larger lakes have created as much interest among sports enthusiasts, who have seen exceptional possibilities for Sportsman's Lake as a recreational center.

Despite cold, rainy weather, several thousand anglers turned out to try their luck at Sportsman's in mid-February when the lake was opened for fishing.

The lake was built by the State Department of Wildlife Conservation with technical and financial assistance from the Soil Conservation Service. The State department was reimbursed for 75 percent of its share of the cost from Federal funds derived from Dingell-Johnson and Pittman-Robertson apportionments.

The 355-acre lake was built on a 1,900-acre tract acquired by the wildlife department as a game management area after sportsmen and others interested in such a project had encouraged the joint enterprise. An automatic drawdown, the principal spillway, provides for a constant level with an additional ten feet of floodwater storage during heavy rainfall periods.

Cost of construction amounted to $132,282 in Wildlife Department funds, and $108,056.25 in Federal funds provided by the Soil Conservation Service.

Studies revealed that almost the entire drainage area on Tiger Creek, a tributary of Wewoka Creek, was well-vegetated grassland and timber. Rock canyons and timber added to the attractiveness of the area for a fishing lake

Note:—The author is editor, OKLAHOMA WILDLIFE, official publication of the Oklahoma Department of Wildlife Conservation.

Sportsman's Lake, as seen from a park area looking toward the dam.

as well as a wildlife habitat.

The dam was completed in September 1958, and the lake stocked with fish in October. The water has remained clear, and fishermen have found the many fingers that extend from the main body of water back into the steeply banked, wooded canyons ideal spots for both boat and bank fishing. Since the lake was opened, largemouth bass and channel catfish up to two pounds and more have been caught. Only largemouth bass, channel catfish, and bluegill were used to stock the lake. It is possible other species may be introduced from the stream that furnishes a constant flow of clear water.

Seminole and Wewoka Sportsmen's clubs as well as civic groups have entered into plans for development of the recreational site and have obtained sanction from the State Wildlife Commission for various improvements for public benefit.

But the benefit by no means ends with the lake as a recreational center. Far greater value will be realized from flood prevention benefits. Rampant Wewoka Creek is one of the worst actors in the State during flood periods and has caused extensive damage to farmland, highways, other public utilities, and municipalities.

Bank and boat fishermen along one of the steeper banks of Sportsman's Lake on opening day.

Oklahoma has been setting an enviable pace in the Nation for participation under Public Law 566. The watershed protection program was given added impetus when the 1959 State legislature appropriated $338,988 for Statewide planning. A total of 73 applications involving 8,700,000 acres have been received by the State Soil Conservation Board. A construction program is well underway on seven creek watersheds.

Many believe that Sportsman's Lake is only pioneering in a field of activity that has much to offer sportsmen throughout the Nation. The P. L. 566 program gives State departments of conservation, municipalities, and sportsmen all of the opportunity they need to make a good program better. Since this structure was started, the Watershed Protection and Flood Pevention Act has been amended to provide Federal financial aid for fish and wildlife developments as a part of watershed projects. This should provide further incentive for projects of this type by reducing the costs to local sponsoring agencies.

A Multi-Purpose Dam in Tennessee

For Flood Prevention and Fish and Wildlife Development

By H. N. Estes

FLOODWATER retarding structure No. 4 in the Thompson Creek watershed will be the first such structure in Tennessee designed for both flood prevention and fish and wildlife benefits. It is the 34th such structure in the Nation built under provisions of Public Law 566, the Watershed Protection and Flood Prevention Act.

Thompson Creek watershed covers about 30 square miles in Weakley and Henry Counties, Tenn. The original sponsors for the small watershed protecton and flood prevention project were the Thompson Creek Watershed District and the Weakley and Henry County

Note:—The author is assistant State conservationist, Soil Conservation Service, Nashville, Tenn.

SCD's. The project was approved for watershed planning in 1956. Structural operations were approved in the fall of 1958 and were started early in 1959. One floodwater retarding structure was completed in the fall of 1959 and a second scheduled for completion in the early summer of 1960. Land treatment in the watershed is progressing satisfactorily.

There is a shortage of fish and wildlife resources and suitable habitat for their improvement in this part of Tennessee. The Tennessee Game and Fish Commission has included in their projected longtime development program a facility for developing the fish and wildlife resources of this area.

The Game and Fish Commission previously had explored the possibilities of making Thompson Creek watershed structure No. 4 a multipurpose structure. But under the arrangements for allocating costs and cost-sharing, they felt that the two-thirds of the total cost they would have to bear was more than they could afford. When the 85th Congress passed the Sikes Amendment to P. L. 566, however, the State agency's cost for participation became considerably less.

The Thompson Creek Watershed District is proud of its watershed improvement work.

So, the State people requested the Soil Conservation Service to take another look with them. Most of the benefits to be derived from fish and wildlife development in the watershed will stem primarily from the enjoyment of sport fishing and hunting. The inclusion of storage capacity to provide for fish and wildlife development will enhance the opportunities for harvesting fish and wildlife. These additional benefits are considered to equal the added cost.

The State Commission negotiated with the local sponsoring organizations to join them as a sponsor. The structure was redesigned to serve the multiple-purpose use. The normal pool was increased from 56 acres to 184 acres. Total storage capacity was increased from 975 acre-feet to 2,423 acre-feet. The new capacity provides for 210 acre-feet of sediment storage, 890 acre-feet for floodwater detention, and 1,323 acre-feet for water supply pool.

This multiple-purpose structure is estimated to cost $154,000. Estimated cost of the original structure planned was $76,000. The Federal Government and sponsors will share equally in the difference of $78,000. Under the approved cost-sharing arrangements for the multiple-purpose structure, the Government is furnishing $65,000 for construction cost and $28,000 for engineering services, amounting to a total cost of $93,000.

By agreement with the Thompson Creek Watershed District, the State Commission agreed to furnish easements and rights-of-way for the facility. Instead of perpetual easements, they purchased all of the land needed for the impoundment of water at a cost of $31,000. Included was enough area for public access to the reservoir. The Watershed District is administering the contract at an estimated cost of $1,000. Total cost to the sponsors is estimated to be $61,000.

The Tennessee Game and Fish Commission has built a number of small lakes for fish and wildlife in Tennessee. The average cost per acre of surface area has been $700. This Thompson Creek Lake will cost them $332 an acre.

Floodwater retarding structure No. 5, the first completed on the Thompson Creek watershed.

PLANT NEMATODES AND SOIL MANAGEMENT SYSTEMS

By Joseph M. Good

THE fact that plant-parasitic nematodes are an important factor in soil management has long been recognized by growers of certain crops. Farmers growing sugar beets in the Western States have been using rotations for control of the sugar beet nematode for many years. Nematode control by use of chemicals has become a standard practice in the pineapple fields of Hawaii; and a large percentage of the flue-cured tobacco in the Southern States is now grown on fields treated wth nematocides. More and more vegetable growers and cotton farmers are becoming users of nematocides as trials have made their advantages apparent.

There have been many trials in recent years of nematocides on soil planted to other crops. For many of these, it is obvious that the use of chemicals is out of the question because of the expense; but the trials have shown that many crops grow much better when the nematodes are controlled and that other nematode control measures should be considered. Much of this information is unpublished, and only a small fraction of it has reached the farmers who can benefit from it. In fact, many farmers have never heard of plant nematodes, and comparatively few have ever seen one, although they can be found by the hundreds of millions per acre in most soils.

Most nematodes are so small as to be almost invisible to the naked eye except under the most favorable conditions. In England, nematodes are called eelworms; and, as this name implies, they are typically eel-shaped worms. Their average length is only about 1/32nd of an inch and their average width is about 1/1000th of an inch. Important exceptions are the females of the root-knot nematodes and of the cyst nematodes, which are about 1/50th of an inch wide.

For the most part, plant nematodes feed in or on plant roots, though some feed on other underground parts such as tubers, bulbs, or rhizomes; and a few feed on stems, leaves, or even flower parts. In only a few cases is the damage easily recognizable as due to nematode attack; most nematode damage can be, and often is, overlooked or attributed to other causes, such as "worn-out" soil, changes in soil type, fertilizer burn, and poor drainage. The situation is further complicated by the close association of nematode damage with diseases caused by some plant-pathogenic bacteria or fungi.

There are stem and bulb nematodes that are internal parasites of oats, rye, alfalfa, clover, and other crops. Infected plants have puffy, twisted, and distorted stems and leaves. One species of stem nematodes attacks Irish potatoes, causing extensive rot of the tuber. Bud and leaf nematodes attack the leaves and buds of chrysanthemums and strawberries, greatly impairing growth and reducing quality and production.

The many species of nematodes that attack plant roots, however, cause the greatest economic damage to agricultual crops. Such external root-feeding nematodes as stubby-root and sting nematodes cause short and stubby roots, while other external parasites such as spiral, stunt, and ring nematodes destroy lateral roots by attacking behind the growing root tip. In both cases, destruction of root tissues produces root decay and causes poorly developed root systems.

Then there are internal root-feeding nematodes such as root-lesion and burrowing nematodes that invade the root tissues and migrate through the roots as they feed. As infection progresses, the roots decay and slough off, leaving a decayed and restricted root system. The well-known root-knot nematodes are internal parasites

Note:—The author is nematologist, Agricultural Research Service, Tifton, Georgia.

No. 55

This is the fifty-fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

that feed in one location and cause conspicuous swellings of the roots, known as root knot.

Also, root-feeding nematodes are known to increase the severity of several plant diseases caused by pathogenic fungi; a common example is Fusarium wilt. More recently, workers in California have shown for the first time that a nematode can transmit a plant virus. They found that a species of dagger nematodes, an external root parasite, transmits the fanleaf virus disease of grapevines.

Plant injury caused by parasitic nematodes reduces plant stands and yields, shortens the productive life of most plants, and for some crops lowers quality and market prices. Badly injured plants often have a tendency to wilt on hot, dry days, particularly in the late afternoon. Infected plants usually are stunted and show signs of nutrient deficiency. In many cases, plants showing nitrogen, potash, phosphorus, iron, copper, zinc, and magnesium deficiency lack these nutrients not because of an inadequate supply of nutrients in the soil but because the damaged root system of the plants cannot obtain sufficient nutrients from the soil. Additional applications of fertilizer in such cases may compensate for some nematode damage, but this is not a satisfactory substitute for a healthy root system.

Most plant nematodes are specialized parasites; that is, they feed and reproduce on some crops but not on others. The degree of specialization varies with the species; some are highly specialized and attack few plants, whereas others attack a wide range of crop plants and weeds.

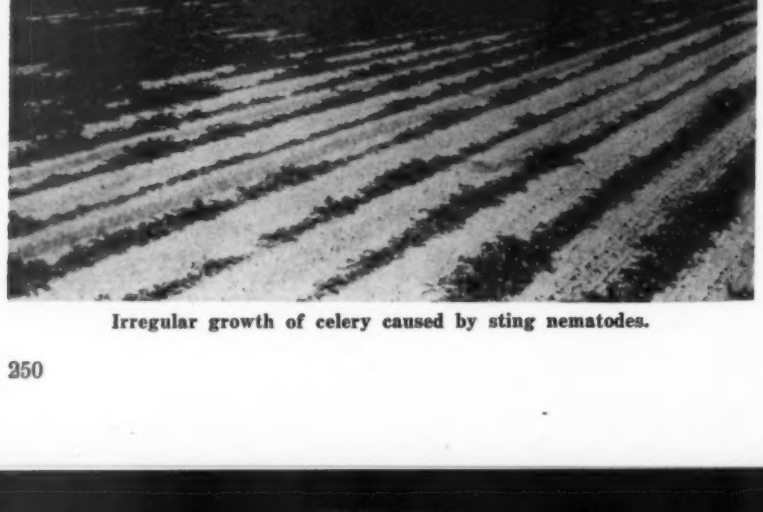
An example of a highly specialized parasite is the soybean-cyst nematode which reproduces on soybeans and a few other leguminous plants, but will not reproduce on the great majority of crop plants or weeds.

The common root-knot nematode of the Southern States (the cotton root-knot nematode) and the root-lesion nematodes are examples of much less specialized parasites. They attack and reproduce on a wide variety of crop plants and weeds. Others, such as the sting nematode, are intermediate in this respect.

The growing of any one crop year after year on the same field is certain to result in an enormous increase of nematodes that specialize on that crop. If planting of the same crop is continued long enough, nematodes specializing on that crop will almost certainly increase to the point where the crop is seriously damaged. Crop rotation tends to prevent this. Many nematologists consider nematode control one of the principal advantages of crop rotation.

When soybeans are grown year after year on soil infested with soybean-cyst nematodes, yields decline and the typical yellowing and stunting of the "yellow dwarf" disease caused by these nematodes appears; but if soybeans are rotated with a crop which is not attacked by this nematode, even for one year, fair crops of soybeans can be grown even on soil which has become heavily infested. A two-year rotation of nonsusceptible crops is even better. However, it is very difficult to eliminate this or any other plant nematode from the soil by crop rotation. If two successive crops of soybeans are grown after the nonsusceptible rotation crop, the second soybean crop almost invariably will be severely damaged. The reason is that the first good soybean crop provides ideal conditions for the increase of the surviving cyst nematodes and increases their numbers back to a dangerous and economically damaging level.

The same principle of rotating nonsusceptible crops with susceptible ones applies to the control of other nematodes that reproduce on only a few hosts. With a species like the cotton root-knot nematode, however, rotation planning becomes difficult because only a few plants are not susceptible to this nematode. Peanuts, for example, are not attacked by the cotton root-knot nematode, but they are attacked by two other species of root-knot nematodes. Therefore, peanuts can be used in rotations to control root knot on cotton; and, conversely, cotton can be used to control the root-knot species that attacks pea-



Irregular growth of celery caused by sting nematodes.

nuts. Thus it becomes evident that knowledge of the kind of nematodes present in a particular field and their habits is essential to intelligent planning of nematode-reducing rotations.

In this connection, cover crops must be considered because they maintain and increase nematodes if they are attacked by the kinds damaging the main crop. Many farmers have promoted nematode problems by growing clover, cowpeas, lupines, winter peas, vetch, lespedeza, and soybeans as cover crops. These plants are excellent hosts for many types of widely distributed nematodes and are sometimes badly injured themselves. Small grains and grass sod have proven more satisfactory for root-knot nematode control than most legume cover crops. However, this is true only for root-knot nematodes, because many other types of nematodes increase on grains and grasses.

In addition to crop rotation, other soil-management practices have been found helpful in controlling nematodes under certain conditions. In southern Florida, root knot can be controlled on some soils by flooding the land for several weeks. Elsewhere, summer and winter fallows with repeated plowing and disking of the land for several months have been effective. In many locations, however, such practices are harmful because the soil texture and structure may be altered by rapid loss of organic matter.

Another practice that has helped reduce nematode populations is the plowing out of nematode-infected roots after harvest. Such a system kills many nematodes by exposing the roots and nematodes to the drying action of sun and wind, and also prevents any further reproduction of nematodes on the crop roots. In the Southern States there is ample time for development of two or three generations of nematodes on the roots of tobacco between the time the last of the crop is havested and the time the tobacco roots are killed by frost. Unless the tobacco roots are destroyed immediately after harvest, there normally is a large increase in nematode numbers in the soil.

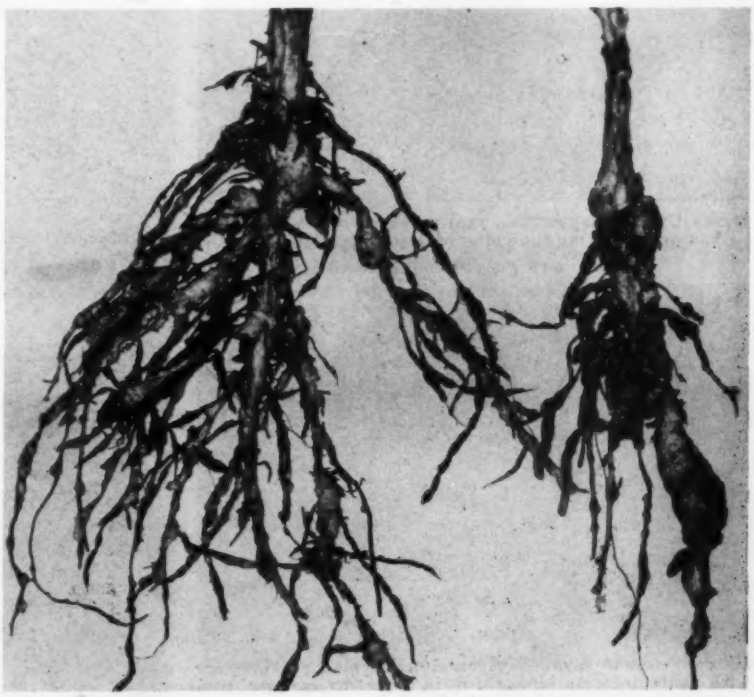
Another approach to nematode control is the development of nematode-resistant or tolerant crops. Such work is now in progress at many locations in the United States, and substantial progress has already been made.

Within the past several years soil fumigants known as nematocides have begun to play an increasingly important role in the production of many field, truck, and tree crops. Nematocides are customarily used in cases where crop rotations cannot be used or have proven inadequate for controlling nematodes.

A number of nematocides and general soil fumigants are now available. Some are gases such as methyl bromide and must be used under covers. Others are liquids and must be used as preplanting applications in order to allow sufficient time for the fumes to escape from the soil before planting. Certain types can be applied at planting time or as a post-planting application around living plants. Solid carriers have been tested and found satisfactory for use with some nematocides.

In summary, the following points should be remembered if nematode

(Continued on p. 259)



Roots of blue lupine that are severely injured by root-knot nematodes.

A Simple Exhibit

By Quentin S. Peterson

THE directors of the Dickinson Soil Conservation District wanted an effective but inexpensive exhibit for the county fair. In looking over the list of district cooperators last summer, the directors noticed that the list included Dr. Fornetti, a local dentist who also operates a tree farm, and the Novara brothers, building contractors and landowners whose conservation plan is designed mainly to utilize wildlife and timber resources to the best advantage. Also on the list were Henry Guiliani, a prominent farmer and one of the district's first cooperators, and Henry Peterson, district forester with the Michigan Department of Conservation. Couldn't these cooperators help promote the district's program? The directors thought so, and sent me on a photographic mission.

It took me only a few hours to take pictures of the cooperators working at their varied occupations. Then, to illustrate the rela-

Note:—The author is work unit conservationist, Soil Conservation Service, Iron Mountain, Mich.

Mrs. Eldon Sougstad says: "To help inadequate tions, have a conser plan

Henry Guiliani says: "Ten years of conservation farming has proven to me the value of a conservation plan."

Henry Peterson says: "My conservation plan provides me with soils information useful in selecting proper tree species."

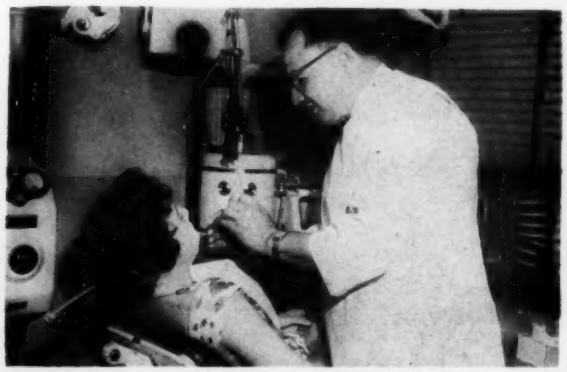
o help ins quate food and shelter for future genera-
ve a conser plan for your land."

tionship between soil and water conservation and the family food supply, I took a picture of Mrs. Eldon Sougstad pouring milk for her two children, Karen and Gregg. We figured that these people, identified mostly with urban activities, would be living testimonials to the effectiveness of the district's program.

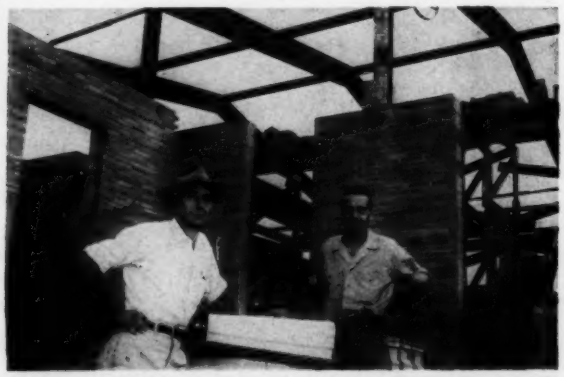
The directors ordered 24- by 30-inch mounted enlargements of the five photos, and had three sheets of 4- by 8-foot pegboard framed and hinged to form panels on which to mount the photos. Captions explained the cooperators' activities and their interest in soil conservation.

This exhibit captured the attention of more than 25,000 people during a Labor Day weekend. Many who previously had known nothing about soil conservaiton asked questions and remained to visit with the directors. Some left to return later with friends. At least half of these visitors recognized one or more of the cooperators pictured.

Why did this simple project attract so much attention? With the comfortable assurance of hindsight reasoning, we think we know the answer. It didn't teach or preach or educate. It was about people—just everyday people—what they believe in and what they are doing about it. It helped us show our community that "Conservation Is Your Job Too."



Dr. Fornetti says: "My conservation plan outlines a plan of operations for my tree farm."



Joe and James Novara say: "Conditions favorable to wildlife are provided for in our conservation plan."

Grass Cover for a Dam and Spillway

By Tillman E. Lee

A large farm pond on the farm of D. K. Hood, Blount County, Tennessee, was completed in the spring of 1958. To get sod on the dam and spillway before fall rains could cause serious erosion, the farmer set out immediately to establish grass cover. The first step was to fertilize and lime the area (right). Manure had been applied and lime was being spread at the time the picture was taken. Fescue was seeded at the rate of 40 pounds per acre. Then a straw mulch was spread and anchored over the new seedings on both the dam (below) and spillway (right center). By late fall the fescuegrass had made sufficient growth to prevent serious erosion on either the dam (lower left) or the spillway (lower right).

Note:—The photographer and author for this picture story is work unit conservationist, Soil Conservation Service, Maryville, Tenn. This sequence of pictures won first place in Statewide competition among SCS employees in Tennessee for the best photographic essay of 1958.

Conservation on the Nipan-Tuck

By I. W. Fobair

IT was a typical Nebraska winter morning, except for the dense, low-lying fog. So it was a real pleasure to be in the warm and cozy Richards kitchen, viewing the snow-blanketed acres of the Nipan-Tuck Ranch on a late January morning.

Nipan-Tuck, the name bestowed upon it by its owners, Bill and Marge Richards, spraddles lazily over the Republican River breaks, just north of Orleans, Nebraska, in the Harlan County Soil and Water Conservation District.

William E. Richards, the recently re-elected President of the National Association of Soil Conservation Districts, stated: "Conservation planning is a 'must' for any successful farming or ranching operation." That was my purpose in being there that winter morning—to assist the Richards in revising their conservation plan.

Major land use changes in recent years called for a revision in Bill's conservation plan. The purchase of additional land called for the seeding of some marginal land to native grass for summer range. Two new irrigation wells necessitated a revision in irrigation water management practices. And the resulting increase in assured winter feed reserves brought a need for an increase in livestock units. These were some of the changes Bill Richards wanted to discuss in revising the plan for his ranching operations.

We discussed the plan and made the revisions Bill deemed necessary. Then we discussed conservation in general and specifically soil and water conservation on the Nipan-Tuck Ranch.

The Richards are not newcomers to conservation. Bill and his father, L. J. Richards, as well as his brother Reid, became district cooperators shortly after the formation of the Harlan County district in 1940. But his interest dates back even beyond that. In 1933, during a summer vacation from college, he was helping his father on the original homestead, now a part of the Nipan-Tuck Ranch. It was then that Bill and his father observed the first terraces on a nearby farm, constructed with the assistance of a local CCC camp.

Bill's father and many other farmers were skeptical about the terraces. But Bill had the opportunity to lease this terraced land in 1935, and he now states emphatically, "We could see immediately that those terraces were serving a very good purpose. I was primarily interested in the conservation of water the first two years, but I found in 1937 that they had another purpose equally important. This was brought out by observing the results of land destruction following a high-intensity rain."

"This storm had washed out a livestock dam, also established by the CCC Camp in 1933, probably because of a badger hole," related Bill. "The dam was large—nearly 20 feet high—and I was unable to

Mr. and Mrs. Richards (seated) discuss their conservation farm plan with I. W. Fobair, SCS technician.

Note:—The author is work unit conservationist, Soil Conservation Service, Alma, Nebraska.

repair it for some time because heavy earth-moving equipment was not available. I walked up through the overfall some time later and to my surprise found that six feet of silt had been deposited behind that structure in just four years. This silt had been deposited in layers and I soon realized that each layer represented each rain of consequence that had occurred. We were obviously losing our topsoil at a rapid rate, since we had treated only about one-sixth of the area above the dam at that time."

Needless to say, these early observations pointed out to Bill the need of conservation as well as the dual purpose being served by the terraces—soil as well as water conservation. Now several miles of terraces and their associated contour tillage operations and residue management practices form an integral part of the Nipan-Tuck landscape. A reconstructed livestock dam and new ones, native grass seedings, up-to-date irrigation practices, shelterbelts, and management practices lend support to the application of Bill's conservation plan.

Because of his early activity and enthusiasm in conservation and his sincere desire to help others, Mr. Richards was elected a supervisor of the Harlan County Soil and Water Conservation District in 1944. He has served as chairman on the local board and is still an active member. He became a director of NASCD in 1952, was Nebraska association president in 1956-57, and was national vice president four years before becoming the association's fifth national president. He was one of the first recipients of the Ak-Sar-Ben Agricultural Achievement Award and is an honorary lifetime member of the Soil Conservation Society of America.

Naturally, all of this activity has represented a good many hours, days, and even weeks away from the Nipan-Tuck. It has meant a lot of personal sacrifice to farmer Bill. The Richards do not have a family, which tends to make longer for Mrs. Richards the hours when the farmer and rancher is on the road.

"You find yourself wanting to be selfish—hoping he won't be gone so much," Mrs. Richards said. "But when you look at how important soil conservation is to our country and its growth, the miles and time away from home seem well worth it."

With such a philosophy, Mrs. Richards has always been an inspiration to Bill's endeavor. Bill further measures his reward through the many fine friends and acquaintances he has made over the years in carrying forth his philosophy of "using each acre according to its capability and treating it according to its needs."

Bill Richards in front of one of his farmstead windbreaks.

Research Aimed At Bunchgrass Return

Two valuable perennial bunchgrasses—once abundant but now scarce in the West—may return as forages. ARS scientists are trying to develop strains of Indian ricegrass and green needlegrass whose seed will sprout instead of remaining dormant.

Overgrazing greatly reduced stands of these grasses. Ranchers were unsuccessful in restoration because most of the seed remained dormant.

Moist-chilling or scarification of the seed with acid increases germination, but these methods are cumbersome, costly, sometimes dangerous, and not always successful.

Indications are that new strains can be developed without the characteristic of seed dormancy, says G. A. Rogler, ARS agronomist at Mandan, N. Dak.

Tests at the Northern Great Plains Field Station show that various strains of the grasses have different seed dormancy characteristics. These strains are being crossed in efforts to select for increased germination.

Assistant Supervisors —Members of a Team

By S. H. Keller

AMONG the first soil conservation districts to hit upon the idea of naming "assistant district supervisors" to help with official projects was Cowley County Soil Conservation District in Kansas.

The minutes of the district board meeting of October 19, 1948, carry this note: "The November meeting is to be a dinner meeting with a special program for assistant district supervisors."

More than a year earlier the Cowley County board had started sending special invitations to farmer and rancher cooperators to attend meetings with the idea of making some of them assistants.

This idea took solid root and has paid off in many ways, not only to the Cowley County district but also to scores of other districts both in and beyond Kansas' borders. More than half of the 105 Kansas soil conservation districts now have assistant supervisors.

During the 11 years since the Cowley board named the five assistants, 42 men have served in that capacity. The selections have not been limited to farmers and ranchers, as are the district supervisors themselves. Business and professional men get the assignments, too.

Some of the assistants who "graduated" to membership on the district board are Charles DeMott, Ray Evans, Paul Clover, Joe Warren (now board chairman), and Milton Kroth.

Each farmer who is chosen by the Kansas Bankers Association for its soil conservation award is automatically invited to serve as an assistant.

Spelled-out duties of these assistant supervisors are: (1) to report needs and promote soil conservation work in their neighborhoods; and (2) to offer suggestions and take part, with voting privileges, on business matters.

The assistant district supervisors

Note:—The author is work unit conservationist, Soil Conservation Service, Winfield, Kans.

At almost any meeting of the Cowley County Soil Conservation District you are likely to find a group similar to this. Standing, from left, Max Quinn, ASC committeeman; Harold Walker, banker; Ernest Hower, Raymond Muret, Noble Bradbury, and John Story, assistant supervisors; Dana Scott, county ASC chairman; Albert Roberts, county commissioner; and Floyd Lowe, assistant supervisor. Seated, from left, Sam Keller, SCS technician; Howard Elrod, supervisor; Joe Warren, board chairman; Charles Smith, county Extension agent; and Milton Kroth, supervisor.

help the board on such projects as the annual meeting, tours and field days, preparation of district material for the special conservation edition of the Winfield Daily Courier and distribution of the edition, and district participation in contests (the board won first place in the Goodyear contest in 1958 and second place in two previous years).

Many of the district's successful projects would not have been nearly as successful without the help of the assistant supervisors, the supervisors agree.

Assistants whose contributions suggest the valued help these people can give are Carl Whitson, writer on the Winfield Courier, and Rev. S. Ben Finley, until recently Pastor of Tisdale Methodist Church, 8 miles east of Winfield.

Whitson carried on an aggressive educational campaign to acquaint his readers with the program of the district and with the need for soil and water conservation.

Finley's work included lectures on soil and water conservation in 46 Kansas districts while he served as assistant.

The Kansas Association of Soil Conservation Districts recognized both men with Certificates of Merit. The Cowley district is the only one having two assistant supervisors win this award.

The Cowley County district board sizes up the help of its assistants this way:

1. They take over a good share of the work load, which usually is more than the five-man board can handle.
2. They are a source of candidates already qualified to serve as members of the board.
3. They can give first-hand information to more farmers and ranchers, multiplying vastly the effectiveness of the board's program.
4. Their participation in board meetings is of great help in planning and in reaching decisions.
5. They offer "grass roots" experience upon which to base and evaluate technical aspects of the district program.

The members of the present Cowley County Soil Conservation District Board declare in no uncertain voice the worth of the board's assistants in their program. "Whatever we accomplish as a district we have to give a lot of credit to them," is the way they put it.

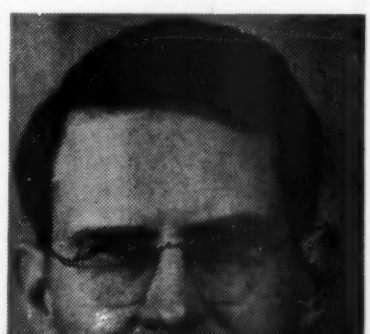
He Practices What He Preaches

SOON after the supervisors of the Cowley County (Kansas) Soil Conservation District started the custom of electing assistant supervisors to help them carry out the district's program, they found a church pastor that they figured they needed as an assistant supervisor. The Reverend S. Ben Finley, pastor of the Tisdale Methodist Church, was also a part-time farmer—and a conservation farmer.

For 6 years (1953-59), the Rev. Finley served as assistant supervisor in the Cowley district. During that time he helped do something about the agricultural as well as the spiritual needs of families in his community. He promoted scientific agriculture, better rural living, and conservation of soil and water on individual farms and in watersheds. While he was pastor at Tisdale church, Finley lectured on conservation in 46 counties in Kansas. At the request of officers of the National Association of Soil Conservation Districts, he participated in national missions of agency cooperation and now is collaborating on a "national land use policy" and program for the Methodist Church.

Finley is ready to try new things. In 1955, the Board asked him to arrange a "Flying Conservation Farmers" field day. This he did with a local aircraft company. Several 4-passenger plane loads of cooperators went up during the afternoon of Saturday, December 31, 1955.

Rev. Finley has acquired a varie-



Reverend S. Ben Finley.

Preacher-farmer Finley (left) helps a neighbor set up a self-feeder for his calves.

ty of personal skills, too. He goes farther than just preaching—he practices! This applies to farming enterprises as well as to his regular church work. Rev. Finley operated the farm which goes with the Pastorate at Tisdale church. He helped neighbors with livestock and operated farm machinery. He bred and raised his own herd of registered Angus cattle.

One day last spring I stopped in and found Rev. Finley in work clothes ready to go to Forrest Roberts' to help work cattle (tattoo, vaccinate, etc.).

Finley also has time for world-wide activities and believes that international exchange of produce directly affects farmers. Hence, he cooperated with other agencies in promoting the "Little United Nations" for 6 years. "Little United Nations," the only organization of its kind, has already had wide publicity. It is to be held in Sumner and Harper Counties, Kans., in 1960.

Finley also directed "Heifers, Incorporated," a program whereby local church members donated cattle and shipped them direct to farmers in Austria and West Germany in the spring of 1957. District cooperators Bob Briscoe and Harold Moon of Tisdale church went with the cattle.

He directed the sending of Jersey bulls to Greece in the spring of 1959. Harold Cole of Wellington, Kans., and Royce Moon of Tisdale accompanied this shipment.

Rev. Finley sponsors student pastors from Southwestern College at Winfield to work with the Tisdale Rural Church. Southwestern College is international in its influence, with many foreign students enrolling each year.

The most recent event among Finley's conservation activities was the presentation of an award to him at the November 1959 convention of the Kansas Association of Soil Conservation Districts. This was a "certificate of merit for outstanding service toward the furtherance of Soil Conservation in the State of Kansas."

—S. H. KELLER

Less than 15 percent of the young people growing up on farms today will stay there as owners or managers.

PLANT NEMATODES

(Continued from P. 251)

damage is to be reduced: Look for indications of nematode damage and try to find out what species are causing trouble; use a wide variety of crop plants in long rotations, avoiding susceptible plants as much as possible; use small grains and grasses instead of legumes as cover crops where root knot is a problem; use nematode-resistant varieties when they are available and suitable for the region; and destroy the roots of plants badly infected with nematodes immediately after harvest. These measures are more effective in preventing nematodes from increasing than they are for controlling large populations once they have become established. Soil fumigation with nematocides should be considered when nematodes become a limiting factor in economic production of crops, provided the crops have sufficient value to justify the cost of fumigation.

Root-knot nematodes decrease value of tobacco crops

North Carolina tests show that the value of tobacco crops was increased by about 25 percent, or $200 to $250 per acre, where tobacco was grown in rotation with grass and small grain crops instead of growing tobacco on the same land for 4 successive years. The increase in value of the crop was attributed mainly to a decrease in numbers of root-knot nematodes in the rotated fields.

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For the 1960 census, the Bureau of the Census describes a farm as: "A farm henceforth must have ten or more acres with agricultural sales of $50 or more per year. Or if it is less than ten acres, it must have a minimum sales of $250 of produce per year."

Quackgrass for Orchard Cover

By John E. Moats

GROW top-quality apples in a heavy quackgrass sod? They said it couldn't be done, but Chester Frazier did it.

Frazier came to the Wenatchee Valley in 1928 from Minnesota. He worked at various orchard jobs until 1944 when he took over the management of Dr. L. E. Hutchinson's 30-acre orchard on Sunnyslope Farm.

Apple worms were a serious problem when Chet took over the management of this orchard, but he reduced them to practically nothing the first year by a good spray program. Nearly all the Delicious trees were of the old common varieties, but at present most of them are of the new red strains. This was accomplished by grafting over and replanting.

Frazier had many soil and water problems, so in 1950 he became a cooperator of the Wenatchee-Entiat Soil Conservation District. A complete conservation plan was prepared with assistance of SCS technicians, and he started a longterm program of building up the soil.

One of the first jobs was to correct an acid condition in the soil by applying two tons of lime per acre. The orchard had been clean-cultivated with a disk several times each year. This practice was discontinued, and 20 acres were seeded to Ladino clover and chewings fescue. The other 10 acres reverted to a heavy quackgrass sod as soon as the disking was stopped.

Frazier tried for several years to get rid of the quackgrass; it had a reputation of being a pest in orchards. He finally decided he couldn't get rid of the quackgrass, so he would leave it and see how it worked as a permanent cover crop. As Chet now comments, "I don't know why we should try to get rid of quackgrass, because there is nothing wrong with it. It is top-flight cover. It requires no more nitrogen than any other grass, probably could get along with less, and it helps build better soil."

When the cover crops are high enough to mow, a rotary beater is used. This leaves the chopped grass on the surface as a mulch. Loss of water by evaporation is decreased, and the tilth and structure of the soil are improved. Chet reports: "The soil condition has changed from compacted to loose and mellow, due primarily to the cover crops."

Note:—The author is work unit conservationist, Soil Conservation Service, Wenatchee, Wash.

Spraying apple trees on the Chester Frazier farm.

With the exception of large limbs, all tree prunings are left on the ground and are shredded by the rotary beater when the cover crop is mowed the first time. Frazier times the roto-beating of the grass so that the cut is made when the growth is green.

Chet has been testing methods of fertilizing and amounts of nitrogen to apply for several years. Since he wished to maintain a good permanent cover crop, he broadcast all of his nitrogen for the grass and trees. Three-fourths of the nitrogen was put on in the fall and the balance in early spring. He started out using approximately 180 pounds of actual nitrogen per acre. At present, he applies only 100 pounds per acre per year. This amount has been sufficient, and no nitrogen deficiencies are in evidence even under the heavy quackgrass sod.

A good measure of Frazier's success as a conservationist and fruit grower is attributed to his irrigation methods. With the help of SCS technicians assisting the Wenatchee-Entiat district, he converted from rill irrigation to sprinklers in 1951. Rather than guess, Frazier uses a soil auger to determine when to irrigate and how much water to apply. He says he uses much less water with his sprinklers than he did with his old rills, and that this method of irrigation helps him to maintain his excellent cover crops.

Mr. and Mrs. Chester Frazier.

The quality and quantity of the apples raised in this orchard are well known throughout the fruit industry. This Frazier attributes primarily to his soil and water conservation practices.

In 1957 the Wenatchee Chamber of Commerce selected Frazier and his wife as "Mr. and Mrs. Conservationist of the Year" for their outstanding achievements in the conservation of soil and water.

Recently Chet Frazier took over the managership of another rundown orchard and is starting a longtime program of building it into a topnotch, productive orchard.

In February 1959 Frazier became a member of the board of supervisors of the Wenatchee-Entiat district, and says he will be able to spread the gospel of conservation a little easier among all the farmers in the district.

Quackgrass cover on Frazier's orchard.

Hybrid Sorghums Outyield Standard Varieties

Hybrid grain sorghums consistently outyielded the best standard varieties in 2-year tests at 6 widely scattered locations in Kansas. On an average, the hybrid yields were about 20 percent higher than that of good standard varieties. But some of the hybrids did considerably better than that.

From 3 to 5 of the best adapted standard varieties were tried in competition with more than 40 hybrids at each of 6 locations. At no place did a standard variety place higher than 27th in competing with the hybrids.

After these tests, research specialists at Kansas State University say: "Planting anything but hybrid seed for sorghum grain production should no longer be considered."

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In Illinois tests, hybrid grain sorghums outyielded standard sorghum varieties by 44 percent. Yields up to 115 bushels per acre were recorded for some hybrids.

Conservation Knowledge of Virginia School Pupils

By Robert H. Giles, Jr.

HOW effective is our conservation education program? How much knowledge of conservation are we "getting across"? How can we determine what Virginians know about conservation? Where should we spend most of our time and money in order to teach conservation? These were the questions asked by conservationists and educators that resulted in a two-year research project designed to provide the answers for an effective, efficient Statewide conservation education program.

The study, conducted by the Virginia Cooperative Wildlife Research Unit and myself, under the supervision of Dr. J. S. Lindzey, was possible through the cooperation of the State Board of Education and its staff. The study was limited to the *renewable* natural resources—soil, water, forests, and wildlife.

A test with 100 multiple-response questions was given to 15,443 Virginia public school pupils, both Caucasian and Negro. The questions were designed simply to test their knowledge of conservation. The pupils were statistically selected as representative of the pupils in grades six through twelve.

The test designed for use in Virginia was similar to five tests that had been given in other parts of the United States since 1939. Mean total test scores did not vary widely, and tended to substantiate the findings of the Virginia study.

Multiple-response "questions" phrased as incomplete statements were prepared from a list of the principles of conservation prepared by myself and the Virginia Cooperative Wildlife Research Unit. The test went through more than four reproductions and a preliminary testing before the final form was printed for the testing program.

Items and test sections were arranged according to difficulty; items were discarded that were considered too difficult or too easy; distractors were arranged at random; vocabulary was slanted at the sixth grade reading level.

Robert H. Giles, Jr.

Many studies indicated that the test had high validity and reliability; i.e., it did test for pupils' knowledge of the principles of conservation and it was consistent in its measurement of this knowledge. A correlation test made with pupil I.Q. scores indicated that the scores did not result from pupils' abilities to read or to reason out the answers but their possession of, or lack of, knowledge of the principles of conservation.

In 1956 Virginia had over 314,000 pupils in its public schools in grades six through twelve. Twenty-three percent of these pupils were Negroes. Of the schools having grades 6 through 12, there were 1,338 for Caucasians, 660 for Negroes. Indian schools were not included in the study. Of the 69 schools selected, 61 participated, administering the tests to the 15,443 pupils.

One of the outstanding results of the study was the differences detected in scores made by pupils living in different community areas. Surburban pupils obtained higher scores than did town, large city, or farm pupils, in that order (59.4, 55.6, and 51.4). The lower scores by rural pupils is surprising because of the apparent abundance of conservation education among agricultural people. The results indicate that suburban pupils have a greater knowledge of the principles of conservation than do rural pupils, and may reflect in rural

Note:—This article was prepared for SOIL CONSERVATION by the Virginia Cooperative Wildlife Research Unit. The study referred to was financed by the Wildlife Management Institute.

education overspecialization and emphasis on agricultural methods and techniques rather than on principles.

The tests indicate that the pupils have more knowledge about the principles of forest conservation than about soil and water conservation, and know least about wildlife conservation of all the resource fields tested.

Increase in test scores by school grades was not constant. The greatest increase occurred between grades 8 and 9, next greatest between 7 and 8, and least increase between grades 11 and 12.

The three most beneficial school courses, in order, were: general science, biology, and geography. Beneficial school courses participated in by the greatest number of pupils were: general science, geography, and history. This information will help determine where conservation can be most efficiently and effectively taught.

The three most beneficial nonschool activities, in order, were: Boy and Girl Scouts, summer camps, and a family interest in nature and conservation. Membership and participation was greatest in the Boy and Girl Scouts, summer camps, and the 4-H Clubs. Thus, scouting and summer camps were shown to be effective as well as contacting a great number of pupils. The answer to the resource agencies' question, "Where can we best spend our time and money to teach conservation?" may lie in these results.

Pupils indicated that reading sportsmen's magazines, watching movies and slides, and reading books on nature and conservation were most helpful in taking the test (in that order). The three helpful activities in which most pupils participated were: watching television, watching movies and slides, and reading newspapers.

Where in the school can conservation be most efficiently taught? Considering that: (1) Pupils in grades 1 through 6 have limited abilities for comprehending conservation; (2) pupil dropout in the public schools is continuous, but is accelerated between the sixth and seventh grades; and (3) greatest increases in pupils' scores occurred between grades 7 and 9, I conclude that conservation can be taught most efficiently and effectively in grades 7, 8, and 9. If one grade is to be selected, grade 7 appears to present the greatest opportunities.

THIS LAND OF OURS. By Alice Harvey Hubbard. 272 pp. 1960. Macmillan Company: New York. $4.95.

THIS book is by a prominent garden club and civic club leader and is directed mainly to garden clubs, women's clubs, and civic groups about the parts they may play in keeping America beautiful and in conserving our natural resources.

The author uses specific cases of community, group, and individual projects to encourage others to "do what you can, where you are, with what you've got." And she is very persuasive. It will be difficult for anyone to read this book without wanting to rush out and get some kind of conservation or landscape beautification project started.

More than 180 projects are discussed in detail. The discussion includes how: A North Carolina community started its land improvement program by holding a mail-box-painting contest; the women of Hawaii eliminated billboards from their scenic highways mainly by putting pressure on the advertisers; the members of a garden club in Texas got a soil conservation district organized by pressuring their husbands and neighbors, who previously had voted it down; and so on.

This book is unique in its approach and is both interesting and readable. Let's hope it is read, discussed, and reviewed by many of the Nation's garden clubs and women's clubs. If it is it should exert a profound influence on the sight and shape of the landscape in the future. It should also be interesting and thought-provoking reading for men and teenagers.

—TOM DALE

GRASSES IN AGRICULTURE. By R. D. Whyte, T. R. G. Moir, and J. P. Cooper. FAO Agricultural Studies No. 42. 418 pp. Illus. 1959. Food and Agriculture Organization of the United Nations: Rome. $4.

THIS 417-page FAO publication authored by three prominent British authorities treats a broad subject from a worldwide point of view.

It begins in Part I with the agronomy of grasses, treating such subjects as: economic advantages; factors which limit grassland farming; soil fertility; establishment, management, and utilization of sown pastures; the use of dung, urine, and artificial fertilizers; the management of irrigated pastures; the feeding value of pastures and grasses in the tropics; production and distribution of seed; and procedures and designs in grassland research.

Part II is devoted to the biology of forage plants. It reviews the

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bioclimatic environment in which plants grow and attempts to map the distribution of the major tribes of the Gramineae. Grasses are described with respect to their adaptation to their environment and are then classified according to their major zones of distribution. Thirty pages are devoted to plant introduction, selection, and breeding.

Part III describes the distribution, agricultural value, and agronomy of 166 grasses. In this group are many native North American species including a considerable number that have been domesticated and brought into agricultural use by the Soil Conservation Service during the last 25 years.

The 560 well-chosen references and literature citations furnish opportunity for wider reading and study. Much of the technical subject matter is clearly presented in the 65 neatly arranged tables. Other data are well presented in 23 figures consisting of graphs, diagrams, charts, and distribution maps.

This book is especially valuable to the specialist for gaining wider knowledge of grasses from all points of view—whether taxonomic, ecological, agronomic, or physiological. The authors have concerned themselves mainly with the principal areas of the subject, drawing upon a wide field of practical knowledge to illustrate the points of discussion. For detailed and more specific knowledge concerning the solution of local farm problems one would need to turn to local floras and literature.

—A. D. Stoesz

A new paper mulch for gardens and truck farms

A new type of paper mulch for gardens and truck crops has been tested for two years at the University of Illinois experiment station with promising results. The improved kraft paper contains a fungicide that keeps the paper from breaking down before the growing season ends. This previously was paper mulching's biggest drawback.

The Illinois tests were made on cucumbers, wth plastic-mulched and ordinary cultivated plots included in the experiment. All mulched plots significantly outyielded the cultivated plots both years.

Plastic and paper mulches offer several benefits. They effectively control weeds, conserve water, keep fruits clean, help warm up the soil in the spring, prevent soil nutrients from leaching, and keep the soil in good physical condition. And they can be laid on a field with a tractor-attached applicator.

The new paper mulch has two advantages over the plastic mulch. First, it costs less. Second, it's easier to dispose of. The paper mulch can be plowed under with ordinary farm implements without interference to following crops. Plastic mulches must be removed from the ground after their useful period is over.

Paper's main disadvantage is that it tears easily. The Illinois testers found, however, that tearing was infrequent if the paper was laid carefully over a smooth seedbed.

A Special Grass Seeder for Western Ranges

The Oregon State College experiment station announces that a special grass seeder has been developed there that may revolutionize seeding on rough rangelands and cutover forest lands. In tests on Oregon range the seeder has given faster sprouting, 2 to 3 times more survival, and higher yields after grass stands are established than where grass was planted with conventional equipment.

The wide wheels on the special seeder use its great weight to pack the soil to make a firm seedbed, and at the same time open small seed furrows in the packed soil. Seed is dropped in the furrows, and covered with loose soil by heavy drag links. The machine has operated successfully on rough land covered with brush, stubble, and rocks.

Further refinements are now being made on the special seeder at the U.S. Forest Service equipment center at Arcadia, Calif.

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A recent survey by a group of Federal agencies disclosed the fact that hundreds of rural communities share the same problem as depressed urban areas—too much labor for the jobs available.